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ABSTRACT

Visits to gardens can contribute not only to children's science learning, but also to meeting other curricular objectives. When school groups visit a garden, they do so with curricular objectives in mind. However, little work has been done on the early experiences of children in gardens. What do children bring to such visits? How do they interpret and communicate their experiences? How do the accompanying adults enhance or inhibit the children's spontaneous interaction with the plants? Conversations of groups of primary school children were collected while they visited the Royal Horticultural Society Garden Wisley. Transcripts were initially analyzed using a systemic network which yielded the major topics of conversation. Additional analysis involved reading and re-reading the transcripts in order to identify which curricular objectives were addressed. From the preliminary data analysis we suggest that children talk spontaneously about the easily observed features of plants such as color, shape and smell and offer past experiences with garden plants. When cued by adults or other children in the group, children attend to do less obvious aspects. The quality of children's interactions with accompanying adults strongly influences the science learning and curricular objectives realized. Implications for the preparation of teachers and parents are presented. (Contains 46 references.) (Author/CCM)

Primary children talk about plants in the garden

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Abstract

Visits to gardens can contribute not only to children's science learning, but also to meeting other curricular objectives. When school groups visit a garden, they do so with curricular objectives in mind. However, little work has been done on the early experiences of children in gardens. What do children bring to such visits? How do they interpret and communicate their experiences? How do the accompanying adults enhance or inhibit the children's spontaneous interaction with the plants? Conversations of groups of primary school children were collected while they visited the Royal Horticultural Society Garden Wisley. Transcripts were initially analysed using a systemic network which yielded the major topics of conversation. Additional analysis involved reading and re-reading the transcripts in order to identify which curricular objectives were addressed. From the preliminary data analysis we suggest that children talk spontaneously about the easily observed features of plants such as colour, shape and smell, and offer past experiences with garden plants. When cued by adults or other children in the group, children attend to less obvious aspects. The quality of children's interactions with accompanying adults strongly influences the science learning and curricular objectives realised. Implications for the preparation of teachers and parents are presented.

Introduction

This paper considers the content of spontaneous comments by children and their accompanying adults on a visits organised by their school to the Royal Horticultural Society Garden at Wisley. There are several aspects to such visits. First of all the curriculum rationale, secondly the nature of the site and its place within the culture from which the pupils and teacher come. Thirdly the previous knowledge of the children and their accompanying adults about not only plants but garden plants.

The educational value of such visits may go beyond the curriculum objectives because the lasting memories are affective ones (Wolins, Jensen, & Ulzheimer, 1992). Bisgrove (1990) argues that gardens 'reflect changes in art, culture, science and technology, politics and society.' Botanic gardens like The Royal Botanic Gardens at Kew and Edinburgh echo his opinion because they once housed the collections of plant hunters. However, in the latter half of the 20th century they under went a shift in approach, from plant introductions to plant conservation and breeding. Whilst other botanic gardens concentrate on their extensive collections of plant species, Wisley displays a huge number of varieties of many single plant species. For instance it holds the national collection of some 200 heather varieties.

In the past five years the Royal Horticultural Society Garden at Wisley has joined the 50 or so botanic gardens that schools may visit. It not only holds a collection of plants in the botanic garden tradition and the national collection of some 1100 heather varieties but there is additionally an element of horticultural excellence with model gardens displayed for the amateur gardener. Children taken to Wisley therefore benefit not only from seeing a broad selection of plants but also how these plants are part of gardening which is closer to their own experience. Moreover, the plants are displayed at Wisley in a horticultural manner not as much as exhibits as they are at 'pure' Botanical gardens. Being exposed to such a garden may influence the child in many ways. Strang (1997) suggests that 'Beliefs and values are received, inculcated and passed on through a process of socialisation that creates a culturally specific relationship with the environment. This process consists of several elements, the creation of categories, the learning of language and the acquisition and dissemination of cultural knowledge. Each involves

an interaction with the physical, social and cultural environment and contributes to the formation of individual and cultural identity.'

Science educators have shown increased interest in using locations that are thought of as informal settings, such as museums, aquaria, and zoos, in science teaching (Lucas, 1981; DfEE 1998). The learning process of constructing meaning can occur whatever the location. The emphasis it is given and the ways in which it is achieved, depends on the rationale for the visit and thus the social composition of groups assembled because of the organisational aspect of the visit, previous knowledge and interaction with the site. All of these aspects of a visit bring about differences in learning between that planned by the school teacher, which occurs within the school building and that which occurs elsewhere in places such as in a museum or zoo or in other sites such as field centres (Scoffham 1980; Gottfried 1981). Furthermore, Gottfried (1981) raised the question as to whether children did learn on school trips whereas Tunnicliffe, Lucas and Osborne (1997) inquire whether the museum visit is a missed educational opportunity.

Science educators have shown increased interest in using locations that are thought of as informal settings, such as museums, aquaria, and zoos, in science teaching (Lucas, 1981). The learning process of constructing meaning can occur whatever the location, but the emphasis it is given, and the way in which it is achieved, depends on the rationale for the visit and thus the social composition of groups. There are differences between learning planned by the school teacher, which occurs within the school building, and that which occurs elsewhere, out of school, in places such as a museum, zoo or in other sites such as field centres.

Out-of-school learning has been considered as non-formal learning ((Bitgood 1989) ; (Maarschaalk 1986), a term also used to describe family learning. Visits to sites out of school are an important part of the formal education of school children (Tunnicliffe, 1996). Visits are undertaken with curriculum objectives (Tunnicliffe 1994; Tunnicliffe 1994 d)) yet the lasting memories are affective ones (Wolins, Jensen, & Ulzheimer 1992). Palmer and Suggate (1996) show that within the United Kingdom the important influences on people's appreciation of the environment is developed from childhood experiences of being taken to sites and from adults who enthuse about the environment. Hart (1997) goes further by arguing that the role of the adult in this situation is vital if the child is to construct meaning from a confused and conflicting array of stimuli.

If children have no experience of a garden, they are excluded from discussing them in literature, art, history, music and design and technology amongst other subjects. Furthermore, they have no opportunity to observe, collect data, clarify beliefs and values concerning gardens which in turn affects how they experience and perceive this aspect of the world (Scoffham 1980).

The constructivist approach to learning strives to develop the personal ideas of children (Driver, 1983) and the application of constructivist theory to teaching in schools, or museums and zoos requires that teachers employ a different orientation to their work than has been done previously. Instead of the *content* of what is to be *taught* being the central concern, the focus is on the *substance* of what the pupils *learn*, and the *meaning* the learners *construct* from the experience (Driver, Asoko, Leach, Mortimer, & Scott 1994; Hein 1995). Such an awareness of the learner's construction of meaning is of great importance to museum and zoos *if* their school visitors are to achieve meaningful learning. School groups to museums do undertake their visit with definite educational objectives (Wolins et al. 1992). Over two thirds of teachers in England,

who visited zoos with their pupils and replied to a questionnaire, expected to teach their own class whilst in the zoo and 88% stated that the zoo visit was to study aspects of zoology within their science curriculum (Tunnicliffe 1994).

Children's understanding of plants

Plants have always been 'human familiars' (Mabey & Evans 1980) and the association with plants is deep in our Western culture. Some of us live in a society removed from the lands and the rhythms of nature, largely protected from the vagaries of the outdoors (Cooper 1998). Thus, it is not surprising that, whilst young children appreciate plants, they gradually adopt the adult attitude that vegetation is wordless and utilitarian (Schneekloth 1989). Children begin their visit to Wisley Garden with feelings about the sites and the nature of the visit. They may also have some preconceptions about plants. Plants have always been 'human familiars' (Mabey & Evans 1980) and the association with plants is deep in our culture but we live in a society removed from the land and the rhythms of nature, protected from the vagaries of the outdoors (Cooper 1998).

'Plant' is a term restricted in everyday science to refer to the small herbaceous Angiosperms also referred to as flowers (Ryman, 1974) and Bell (as Stead 1980) found that children aged 9-15 had a much narrower meaning of the word plant than did biologists. A tree, for example, is not considered as a plant and everyday grouping of plants such as weeds, vegetables and seeds were considered equivalent categories to 'plant' not subsets. Moreover, historical ideas which are not part of the consensus of scientific knowledge such that plants obtain their food through their roots (Barker, 1995) persist within society and thus within the children.

Whilst a garden is full of plants are the children able to discriminate between different types and to recognise and name any? Askham (1976) showed that young children can classify plants but do not use one particular method but look for salient features such as prominent leaves, colour or tactile features in their groupings. What cannot be controlled of course is what the children actually learn nor who they will learn if from.

Off site visits are not just a day out, everyone needs to know what is to be achieved and how the visit will be integrated into lessons both before and after it (DfEE 1998a). Most school parties divide up the pupils so that there are between two and ten pupils per adult and it is because of this capacity to divide the party into sub groups that the visit is initiated. (DfEE 1998a) One of the important considerations of this study is exploring the impact of responses of school pupils to Wisley Garden in the presence of an adult. One of the important considerations in a study such as this one which is considering the impact and responses of school pupils on a visited organised within their curriculum is the preparation for the visit provided by the school often in conjunction with the educational staff of the horticultural agrarian and secondly the adult who accompanies the sub groups of children. Most school parties divide up the pupils so that there is between one and ten pupils per adult and it is in these subgroups of the school party that the visit is undertaken. The encounter with the parents and the adults with them may be positive or reinforce previous attitudes (Snow and Bryam, 1997). Moreover, it has been shown that the type of adult, class teacher, parent or no adult at all affects the content of the dialogue on out of school visits (Tunnicliffe 1995). Teachers often seek advice and help with organising visits to off site locations so that the expedition achieves curriculum objectives (DfEE 1998). This is the case at Wisley and all, except one of the teachers involved in the visits

recorded here, took advantage of a preliminary discussion and tour with the Education Officer. All asked for the visit to include mention of plants, their form, function and uses either directly or indirectly. Usually pupils received a taught session in the garden from the Education Officer as well as a walk around with their teacher or another adult. Most of these groups had a trail leaflet for each subgroup leader. The trail 'Everyday Science' was to guide them and to offer points of educational interest for them to look at en route. Thus, much depends in general terms on what children themselves bring to the experience of visiting a garden and how they share this with others. By listening to and analysing the content of the conversations of visitors an insight into their interest and previous experience can be gained. The interventions and skills of accompanying adults has the potential to transform this experience to provide a longer lasting and deeper understanding (White 1997).

Methodology

This study was carried out in the gardens of the Royal Horticultural Society at Wisley, Surrey, England. Groups of primary school pupils (aged 5 to 11 years), without an official guide from the gardens, but with a trail sheet provided by the Education Department, were accompanied, with the permission of the school which had been sought before the visit. The conversations of sub groups of the group were listened to and recorded by hand. Tape recording had proved too difficult in a pilot study because of interference, in particular the distance between young visitors and other noises. A similar technique had been used previously in Kew Gardens.

The field notes were transcribed as soon after the visit as possible. To facilitate the analysis of the transcripts the data were considered in terms of units of conversations. A unit of conversation was defined as the 'group conversation in front of any one exhibit from the beginning of the conversation until it ceased or the conversation could no longer be heard without the researcher being intrusive.' The units of conversation were identified during the typing of the transcripts from the 'voices' of the different members of the group. An example of a unit of conversation is shown below.

Year one children (5 to 6 years old)

- | | | |
|-----|-------|---|
| 105 | Adult | You can see weeds in between the plants |
| | Boy 1 | There's a flower there's |
| | Boy 2 | I can't see any red ones |
| | Boy 1 | Ah yes- I can. |

Year 4 children (7 to 8 years old)

- | | | |
|-----|---------|--|
| 115 | Teacher | Through there are lots of flowers- what are they called? |
| | Girl | Roses |
| | Teacher | We'll see some more later |
| | Boy | I had a yellow one in my Grandmas and Grandpa's garden |
| | Teacher | Really? We're going to see them. |

There are a great many ways of analysing conversations (Mishler 1986; Cortazzi 1993; MacWinney 1995; Tunnicliffe and Reiss 1999). In the study reported in this paper, two methods were used.

Firstly, a systemic network analysis was used. A systemic network is a means of grouping or categorising things, in this case conversations, to be a parsimonious representation of the data, while preserving the relationships between categories in such a way that comparisons can be made between groups. It is a type of analysis that changes qualitative into quantifiable data and each topic of conversation was coded according to the systemic network developed from the work of Bliss, Monk and Ogborn (Bliss, Monk, & Ogborn 1983) and which had been worked out from pilot studies in which 50 conversations about animals had been collected and inspected for patterns of content and form (Secondly after all 519 conversations had been transcribed, they were read through repeatedly and then classified into three broad categories according to the content of the comments made by the participating children. Inevitably there is a certain degree of arbitrariness as to how such classifications are done but we settled on the 3 categories as defined in Table 1 according to sensory perceptions, comments pertaining to a garden and comments with a particular human affinity (Tunnicliffe 1995) and modified for plants by subsisting the categories for the equivalent botanical ones. The preliminary inspection and categorising of the pilot conversations showed that the visitors looked at specific attributes of the plants, asked question and made statements about what they already knew, commented on their own experiences with the plants and talked about their whereabouts and gave instructions to each other.

The network analysis

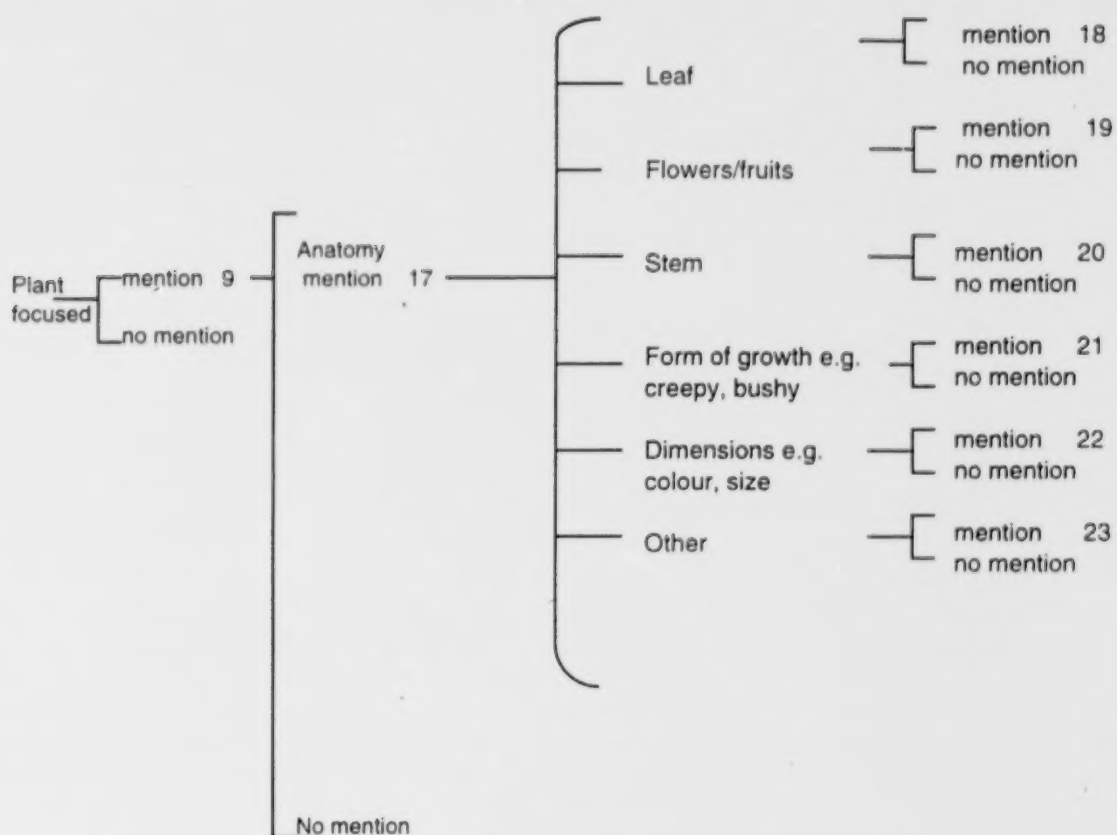
The network can be regarded analogously as the sets of nested boxes into which the researcher puts each part of the conversation and sections are presented in Figure 1. There were 56 categories in this network some of which are shown in figure 1. A bar, '|', indicates that an attribute may be either/or but not a member of both categories, whilst a bracket, '{', indicates one of a number of categories which an animal may have.

The three main super ordinate categories were, 'exhibit focused comments', 'management and social comments' and 'exhibit access' or 'orientation comments' in which visitors searched for or located the animals were another super-ordinate category and exhibit focused comments. A theoretical 'waste basket category' for topics such as security alert announcement comments and which were uncategorised was provided. The comments directly referring to the exhibits were divided into "other exhibit" comments, such as artefacts which were features of exhibits such as gravel or a statue or biofacts such as animals seen amongst the plants such as frogs in the pond) and those which focused on plants.

The plant-focused category was subcategorised into four subordinate groups:

- other interpretative comments, which included knowledge source comments such as questions and references to a source of the information proffered;
- affective comments which included emotive responses such as 'Ah!' or 'Ugh';
- environmental comments referring to the natural habitat or endangered status of the species;
- comments about the actual plants- names, structure of physiology which formed three subsections.

Figure 1
Part of the systemic network used in analysing the content of the conversations of the groups.



The conversations were coded using the number of the relevant category which was written above the appropriate words on the transcript. An entry was typed into the columns within the spread sheet of Minitab. Hence a sentence from one of the above conversations received the following codings.

115		6	19	44
Teacher	Through there are lots of flowers- what are they called?			
	29/32			
Girl	Roses			

If more than one comment of a particular category (e.g. a name) occurred within a single conversation, it not scored again. Hence the analysis shows the number of conversations within which a topic is mentioned not the number of overall times that a topic is mentioned.

Read/ re-read inspection analysis

A second method of analysis was a read/re-read technique to establish the broad categories and their subdivisions based on the children's everyday understanding that they bring with them. In other words, their mental model (Duit and Glynn 1996) of a garden and gardening. Each comment on a particular topic, even when there was more than one reference to it in a conversation unit, was counted. The reason being that it is important to capture the essential elements of the meaning to those involved (Fielding & Fielding 1990). Content of the conversation unit contributed by an adult was not included because the analysis only sought to elucidate the content of children's comments and their individual experience or understanding.

Each of the following categories was listed at the head of a spreadsheet column and the comments categorised and inserted as they appeared in the text:

Colour, size, shape, scent, feel, sound, taste, plant name, parts of plant, life cycle, affinity, gardening practice, knowledge about gardening, animals in the garden, specific affinity, similes, family connections were the headings. All of the teachers had asked for 'sensory' information - texture, colour, scent for example, so this was one major category in the analysis.

121 Teacher What colour do you call that?

Girls Light pink (colour)

Teacher Pearly pink

Girl They're lovely.(affinity)

176 Girl Oh Mum smell (scent) this, it's nice.(affinity)

Adult Oh yes, you wouldn't have thought they'd have a scent.

289 Boy There are two different greens (colour)- this light one is all soft (feel)

A second one 'pertaining to gardening' embraced comments about plant biology in relation to gardening and similarly references to gardens and gardening which showed an appreciation and understanding of their general nature and significance.

Plant names.

1.. Teacher Who said Honeysuckle? How did you know?

Girl Me (Plant name known)- My Mum's got some.(family connection)

Plant parts.

371 Girl My next door neighbour's (family connection)got a house with some of these things (lilies) outside and they have pollen (plant parts)on those things there and it stains.

Life cycles - a good example:

283 Boy When plants have been out for a long time they start to be dead!

Gardening - a good example:

493 Girl This is like what they do on Ground Force (TV programme).

Knowledge about gardens and gardening in general e.g. compost, extract from conversational unit 252:

Teacher. This is where you put all the rubbish from the garden and food, and what does it turn into?

Boy Soil!

Animals in the garden - knowledge coupled with observation of plant part

33 Girl I've found holes in the leaf. (plant part)

Teacher Oh yes Nicola, what does that mean?

Girl Caterpillars! (animals in the garden)

The last category brought together comment from their personal lives which showed an 'affinity' for plants within their personal experience.

Specific affinity - an example is:

1. Boy Ugh, look at that there (picked up leaf) it's all crumpled but it's a nice one.

Similes:

458 Boy They've mowed it (the grass) in lines.(gardening activity).

Boy Yeh like a football pitch.(simile).

Family connections - an example of family connection and gardening activity:

456 1. Boy I was gardening last night with my dad. I cut the lawn and did the strimming

Adult Do you like gardening?

Boy Yes.(affinity)

Results

There were 519 conversations. The results of the Systemic network analysis are shown in Table 1.

Table 1
Main categories of comments of both adults and children in Wisley Gardens

Category of Comment	n= 519 no %	
Management/Social	230	44
Exhibit Access	229	44
Other exhibit comments	222	43
exhibit focused	494	95
plant focused comments	410	79
Anatomical	264	51
Functional	47	9
Naming	282	54
All interpretative	332	64
Affective	100	19
Emotive	100	19
Other Interpretative	250	48
Knowledge source	245	47
Human/plant	117	23
Real/live	14	3
Environment	17	3

These data show that overall 95% of conversations were focused on the exhibits- the gardens and the plants- and 79% of the conversations contained a comment about a plant. Anatomical features of plants occurred in 51% of all conversations whereas only 9% referred to a physiological function and 54% named in some ways a plant. Emotions and affective attitudes are not predominant in conversations and only 19% of the exchanges expressed an ambition. Overall, 64% of conversations were of some type of interpretative nature with 48% being of 'other interpretative nature' which includes 47% being a knowledge source comment- a question or a statement, 3% discussing the reality of the specimen. Only 3% mentioned an environmental issue, such as the natural habitat or the conservation issues associated with the plant- which is a feature of Wisley Horticultural Gardens. However, 23% of the conversational exchanges considered the human plant relationship, most often as in the second conversational example, these were about the speaker's relationship with the plant through gardening at home.

The groups commented mostly about anatomical features of the plants of which 13% of all conversations mentioned leaves, 20% flowers or fruits whilst 4% mentioned the stem. The features mentioned had to stand out from the rest of the plant. As for example do the leaves of *Gunnera sp*

358 Boy (8 year old) Wow! Look at those leaves. I have seen one plant like that but not such big leaves!

The dimensions of the plants, their colour or size, were mentioned most of all and this occurred in 26% of all conversations. Other comments occurred in 7% of conversations and were about items such as prickles. The most frequent function of plants which was mentioned was growth, in 9% of conversations, followed by food at 3% and 'other' including reproduction in 5%. For example sometimes the teachers gave the children the information but on occasions they drew the information from the pupils.

Example of Giving the information 9 year olds

- 335 Teacher What do you see ? (at a stretch of water)
 Boy Fish!
 Boy 2 Ducks!
 Teacher Ben's got his hand up!
 Boy 3 Lily pads!
 Teacher All the same?
 Boy 3 No lots of different ones.
 Teacher And why are they flat Anyone? It's to get as much sunlight as possible to make lots of oxygen- what else can you see?

Example of Drawing out the information 9 year old pupils.

- 336 Teacher As we walk down here (a herbaceous border) I want you to have a really go sniff.....so does anything come to mind about the smell?
 Girl Sweet.
 Teacher Yes very heavy- why?
 Boy To attract bees to pollinate them and reproduce.

The data in Table 2 show the effect the social grouping within which the child looks at the gardens. There may be adult with the children or children speaking alone. Furthermore the data have been divided into whether the adult was a teacher, a parent helper or chaperone.

The presence of an adult does increase the content of conversations of school groups (Table 2) The data show that without an adult present the pupils make significantly fewer management and social comments (and fewer comments about other aspects of the exhibits). The pupils alone, with no adult accompanying them, make fewer comments about physiological functions of the plants but name and comment about the anatomy at similar rates. Pupils alone generate significantly fewer interpretative comments- questions and statements of knowledge- but comment similarly about human/plant interactions

The data reveal that these visitors have an everyday system of classifying the plants. Weeds for example are not plants as the following statement indicates.

- Adult You can see weeds in between the plants

Table2

Main categories of comments arranged by social groups, adults with pupils,, teachers with pupils or pupils only. Some of the pupils (302) were 'alone' when pupil was speaking aloud to no one in particular and was not holding a dialogue but 'broadcasting'.

Category of Comment	Chaperones n = 79 no %	Teachers n= 138 no %	All adults n=217	Pupils only n= 302 58%	Ch ² 2df pupils, teachers & chaperones	probability
Management/ Social	50 10	80 15	130 25	100 19	13.27	p<0.005
Exhibit Access	43 8	62 12	105 20	124 24	4.59	
Other exhibit comments	61 12	81 16	112 22	110 21	19.67	p<0.005
exhibit focused	76 15	134 26	210 44	284 55	2.15	
plant focused comments	65 13	111 21	176 34	234 45	9.97	p<0.01
Anatomical	42 8	72 14	114 23	150 29	0.43	
Functional	7 1	23 4	30 6	17 3	14.02	p<0.005
Naming	42 8	80 15	122 24	160 31	1.00	
All interpretative	71 14	121 23	192 37	140 27	97.30	p<0.005
Affective	24 5	21 4	45 9	55 11	7.94	p<0.25
Emotive	24 5	21 4	45 9	55 11	7.94	p<0.25
Other Interpretative	47 9	114 22	161 31	89 17	111.19	p<0.005
Knowledge source	54 10	112 22	166 32	79 15	28.97	p<0.005
Human/ plant	17 3	38 7	55 11	59 11	3.55	
Real/live	0 0	5 1	5 1	9 2	N/A ¹	
Environ- ment	1 0	12 2	13 3	4 1	N/A	

1 'For tables larger than 2 x 2 the mean of the expected values should be six or more for tests at the 5% level; for tests at more demanding levels, like 1% or 0.1%, the minimum expected value should be somewhat higher' (Erickson and Nosanchuk 1979:255). Therefore the Chi squared value is not given for results that fall into this category of below minimum number expected values.
probability. * = p < 0.05, ** = p < 0.025; *** = p < 0.01; **** = p < 0.005

Whilst many conversational exchange are missed teaching opportunities, a few teachers used viewing plants to reinforce other area of the curriculum, particularly literacy

- 113 Teacher They are iris. What does 'Iris' begin with?
 Girl Capital 'I'
 Teacher Yes, capital 'I' because it is the name of a plant.
 125 Holly Teacher What do you think this is?
 Girl Holly.
 Teacher How do you spell it?
 Girl H O L L Y.

Opportunities for mathematical application were also used from time to time.

- 131 Teacher If I put my hands here count how many arches there are?

- | | | |
|-----|---------|---|
| | Pupils | 12, 11, 6. |
| | Teacher | What is this shape? |
| | Girl | A hexagon has 6 sides. |
| | Teacher | How do you remember? |
| | Girl | hexagon has an 'x' and six has an 'x'. |
| 216 | Teacher | These are called Alliums .They are seeds. |
| | Girl | Allium, Hello Allium. |
| | Teacher | What shape is this? |
| | Boy | Circle. |
| | Girl | Sphere. |
| | Teacher | Yes sphere well done. |

Children did not all understand the conventions of gardens as illustrated by the following comment from a six year old boy looking at rose bushes each with a naming label inserted in the ground next to the plant.

- | | | |
|-----|-------|--------------------------|
| 118 | Adult | Why do they have labels? |
| | Boy | Because they've died! |

As other researchers have found, the opportunity to interact with the plants with more than the sense of sight is an important part of the experience of visiting the gardens.

- | | | |
|-----|---------|---|
| 122 | Boy | Let's see what they smell like. Ugh! It smells like pooh!(at roses) |
| 176 | Girl | Oh Mum smell this, it's nice. |
| | Adult | Oh yes ,you wouldn't have thought they'd have a scent. |
| 177 | Boy | In the hot house |
| | Teacher | We're in a jungle! |
| | Boy 1 | What does it feel like? |
| | Boy 2 | A jungle. |
| | Boy 3 | Warm. |
| | Teacher | Rainy. |
| | Teacher | It's not rainy but it's damp. |

Pupils delighted in recognising plants with which they were familiar.

6 year old boy

- | | | |
|-----|-----|---|
| 246 | Boy | My grandma's beans are up here beyond the string! |
|-----|-----|---|

8 year old boy

- | | | |
|-----|-----|--|
| 347 | Boy | Tomatoes- the ones in the greenhouse My Granddad has a whole bunch of them |
|-----|-----|--|

- | | | |
|-----|-----|---|
| 355 | Boy | Artichokes- we've got them in our back garden |
|-----|-----|---|

However, if there were an animal moving, the attention of the groups was immediately diverted

from static plants.

- 134 Boy A fish!
 Boy A dragonfly!
- 135 Girl Oh look!
 Teacher If you look in front of you, you see Water Boatmen!
- 136 Teacher The lily pads are moving!
 Adult I think it's a fish!
 Boy Look- fish!

Hence the network analysis shows that the visitors comment about salient features and seek to explain that which they see from their previous knowledge and understanding. Adults and pupils feed the conversation of each other on occasion but also speak in statements with a series of statements which may not be linked in thought development.

Read- Re read results

The read/re-read analysis yielded the results shown in Table 3.

Table 3
Read re-read analysis results

Category	Number of instances mentioned overall by children	
Sensory	a) sight (includes colour, size, shape)	30
	b) smell	2
	c) touch	5
	d) hearing	<1
	e) taste	<1
	f) sight	30
Pertaining to a garden	a) plant names	20
	b) plant parts	8
	c) life cycles	2
	d) gardening	2
	e) knowledge about gardens /gardening in general	7
	f) animals in gardens	7
Affinity	a) specific affinity	3
	b) similes	9
	c) family connections	4

Personal communication with the Education Officer at Wisley revealed that some teachers had specifically come to the garden so that the children could have sensory experience. The visual

element was given most attention with colour, size and shape figuring strongly. Smell was attempted and feeling plants was popular. Sound and taste were almost ignored.

Colour, which is quite a marked feature in a garden like Wisley was mentioned most with blue, pink, red, purple, yellow, white, cream or green being mentioned in 16% of exchanges or exclamations. For one, colour combinations was 'scary'. Size was more important to the children (9%) than shape (5%) and both could be included in visual stimulation at a total of 30%.

The comments on smell ranges from 'disgusting' through 'lovely' to 'Oh my God it smells of curry' and only 2% of all comments related to scent. Touching and feeling plants is often difficult for those who have been deterred by mothers with a dirt and germ fixation and some mothers accompanying groups were prone to this and so influenced some children's sensory exploration (Hamilton 1998). However, children will instinctively reach out and touch something which looks interesting. Cacti were the favourite followed by *Gunnera* which one child described as 'feels like a man's chin' which is very apt. Five per cent of all conversations related to the way different plants felt to the children's skin. The connection between texture and function was not referred to by accompanying adults even when a child, pricked by a thorn which could have been used as an example of a plant deterring predators.

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Adult	Now these ones are these roses - lots of little petals not like the big roses.
Boy	White and pink.
Boy 2	I've hurt myself (touching rose).
Adult	Well, they've thorns, we tell you not to touch

If some mothers are not keen for children to touch plants, they are obsessive about them putting anything in their mouths except their packed lunch and then only if they have washed their hands. In one conversation a child asked if he should taste rosemary and was told that it might upset his tummy, (CU515). No other mention was made of taste, even in the vegetable garden which all of them visited on their trail.

Auditory sensation was only mentioned once, at the waterfall, although there were other opportunities provided by the trail followed or walk around the garden in the garden which could have given rise to comment about sounds or noise had the adult cued the children.

Interestingly the visual elements available on the trail were not exploited although the teachers had placed emphasis on this and all sensory stimuli in planning meeting with the education department staff. The comments heard were the normal ones about salient features found in zoos and botanic gardens.

Pupils of between five and eleven are expected to be taught the names and roles of parts of the plant within their science lessons as part of the National Curriculum entitlement, hence it is not surprising that there is mention in the conversations of such parts, including the visible flowers, petals, leaves, berries, stalks and the unseen roots which some children knew were underground. Specific plants could be named from memory or from reading from labels and a number of children recalled information about pollination of flowers so that they can reproduce, as taught

in national curriculum science. However seed dispersal was mentioned only once in the conversations recorded and this referred to the dandelion which is part of everyday science experience for English children - blowing the fruits off a 'dandelion clock'. Specific plants were only mentioned in 8% of conversations.

The results from the read/re-read show that comments about gardens, gardening and specific plants particularly those with family connections were heard. This latter category appears specific to visits to this garden and similar comments about personal knowledge and associations are not heard in other similar locations such as botanic gardens, zoos and field centres (Tunncliffe 1995, 1998, 2000). However, like other locations, children tried to explain or interpret what they saw in more familiar terms using similes. Some plants had 'freckles', looked like a 'butterfly', 'icicles' or 'umbrellas', were shaped like 'ballerinas', 'sentries' or 'loads of snakes' and they compared them with other plants which were more familiar like buttercups, stinging nettles or toadstools. The closely mowed grass for one child was like a football pitch and another recognised that it was not plastic because it 'felt wiggly'. Nine percent of comments were in the form of similes.

Interestingly, children compared the plants that they saw not only with the familiar but also related them to their home context in 4% of conversations. For example 'My grandma's beans are up beyond the string,' and another child commenting 'My bean at home is taller than its stick'. Grandparents feature in a quarter of the comments about family (family being 4% of the total) and both dads, mums and aunts are mentioned. Food was not taken as a separate category although taste was. It features principally in questions about the time they are going to eat or comments in terms of likes and dislikes. For example in CU 77 -99, the children are in either the fruit or vegetable garden. They mention fruit and vegetables by name but only refer to food twice 'Don't touch it someone's got to eat it' and 'Oh I love artichokes'. From another school in the same place (CU 225 -252) two pupils do mention wanting to eat the fruit but the only mention of taste comes with a child who says 'I don't like red lettuce only green' when looking at a bed in which both types are grown.

Some children appreciate the jobs which gardening entails and 2 percent of conversations touch on some of them. Planting, clipping, weeding and mowing are mentioned but 'honeysuckle is hard to pull up' indicates that this child has taken part.

A few children have developed considerable knowledge for their age about gardens and plants. One girl bemoaning the fact that her sunflower has black fly and a boy giving his teacher the explanation of how waterfalls add oxygen for water plants. One boy talks about strimming. Conversations did not include mention of children's own gardens or their own pots of plants. Only two of the conversations mention a plant or garden at school. Comments relating to knowledge of gardening were heard in 7% of conversations.

From the conversations it becomes clear that some children do have a code of conduct and behaviour in a garden. They were keen to point out to others that they should not do certain things like pick fruit, drop litter or stand on flower beds. However, field observations indicated that some children did do these things if they thought they were unobserved. One child remarked; 'you must never tread on the flowers or they will die.' Another child warned 'Don't put your hands in the water, you don't want to get germs.' Both comments indicate remembered cautions from adults. One child inquired 'Why do they put pooh around plants?' to which a

peer replied 'It helps them to grow' indicating a different and practical approach to distasteful topics and to gardening.

The transcripts reveal that adults rarely cued pupils into meaningful dialogue or pointed out features of educational interest. For instance there were few attempts to compare one plant with another growing close by and in the vegetable garden about their eating habits and only once did an adult refer to the part of the plant eaten. Use made of greenhouses was not considered even though everyone saw one, and indeed some children entered one, in the vegetable garden. Opening comments which could have led to an educational dialogue in terms of involving the child's own experience and developing knowledge and understanding, were seldom pursued. As has been noted in zoos and other museums, very few children did read the labels on plants but one group was told about the Latin names and why Latin is used by their teacher. In summary, the comment of children looking at plants in the garden were about obvious features which they could see and the plants were referred to by everyday names. The children did recognise plants for which they had encountered at home and some children referred to gardening and gardening techniques which they had used. Scientific topics were rarely mentioned and then not by the pupils.

Discussion

Both types of analysis, adults and children but counting only one mention of each topic and read/re-read counting the instances where children mention a topic, add a dimension to the inferences which can be drawn. As has been reported elsewhere, when school groups have looked at living organisms (Tunncliffe 1995) the groups commented on what was obvious. However groups here did relate, albeit in a few conversations, to their own experience of plants and gardening and that of their families. Children look at the noticeable features and, when they use the plant name, do not use reasons to justify the name using any one system to do so. It is unlikely that this age group will have been shown any systematic way of naming plants. Their knowledge comes from their own remembered experience and although their looking is haphazard, they do recognise familiar plants. Most have an anthropocentric view of plants in terms of eating or cultivating or maintaining them for their pleasure.

The physiological functioning of plants was hardly talked about although a few mention seed production and photosynthesis. As Askham (1976) found in the USA, pupils and their accompanying adults focus on particular parts of the plants such as leaves, prickly stem, colourful flower or an obvious fruit or pattern on leaf of the veins. There is no pattern to the observations other than it is prominent and different features that catch their attention. By the same token if animals appeared in the garden they took the children's attention away from plants.

Teachers had stated the objectives for the visit in discussion with the education staff at Wisley. However, opportunities for teaching and learning the relevant science is missed irrespective of the curriculum objectives stated. As in the case of zoo visits, conservation is not commented upon (Tunncliffe 1995) nor its link with the food web complexity made. Thus, a similar pattern of comments of salient features but no biological concepts is seen in a garden as it is to any more than at other sites for science education out of school.

Visits to gardens provides the opportunity to connect to and consolidate science learning from school about plants as crucial organisms. Children need to be familiar with plants because they

are one of the most important elements in the environment. The opportunity for observation of plants at first hand may have been lacking for some of the children in their normal lives. If children are to make informed decisions in the future about the environment, they need opportunities to increase their knowledge of that environment (Freeman 1995). There is however a tension between those who wish to put over the environmental message and the educators (Geesteranus 1999) who want to impart facts. One group of Junior age children followed the 'Everyday Science' trail containing details of a garden food web. This concept is accepted in schools but the word biodiversity, in a place overflowing with it, was not given a single mention. Sustainability is achieved in part by management of plants, and a garden is an ideal location to raise the topic, but it was not. Teachers appear unenthusiastic and rarely include cross curricular themes even though education staff point them out that the garden is an ideal learning situation for these themes. It is worth pointing out that more dialogue was heard here than has been the case at any other locations.

By knowing the learning objectives for the groups and recording the conversations, there is an opportunity to determine how the experience of a garden visit met these objectives. Did it indeed influence skills in recognition of patterns and hence taxonomy, enhance memory which will aid future understanding and make connections between human activity and plants? Judging from the conversation recorded, the teacher's intentions may not have been made clear to the accompanying adults.

Opening comments which could have led to an educational dialogue in terms of involving the child's own experience and developing knowledge and understanding, were seldom pursued. One such issue is food and where it comes from. Growing food at home and eating habits were given scant mention on these visits. It could be that it was taken for granted, but even so it represents one of many missed opportunity for children who have not made a connection or have no access to a garden or allotment where food plants are grown.

The adults with the groups appear to be ineffective in guiding the observations of children towards curriculum objectives often perpetuating misconceptions and errors of classification (see conversation unit 105 above), and use of artefacts. Indeed the inadequate public understanding of science is manifest in the responses of many of the adults. They can even deaden children's sense of wonder and enthusiasm (Nicholls 1990). However, the presence of an adult does increase the content of conversations of school groups.

Teachers have to justify taking pupils on school visits, both to parents, and to the school's governors. It is crucial therefore that the teacher has a very clear idea of the concepts she wants covered and that all of the adults are well briefed on these facts and where they are best discussed. All too often chaperones are given lists of names and a timetable and at Wisley, a trail sheet, but no other preparation (DfEE 1998a). Furthermore primary teachers reveal in many of the conversations analysed that their own planning and subject knowledge is inadequate to impart the curriculum objectives cited and their knowledge is insufficient for them to be able to apply what they do know to a real life situation. Teachers whose conversations yielded the most satisfactory comments in terms of curriculum content had made a preliminary visit to Wisley Garden but the conversations also showed that some of these teachers has failed to pass on what they had learnt from this visit, to the chaperones with them.

Parent helpers are necessary for legal reasons (DfEE 1998a). They are only an asset in educational terms if they understand their educational role too and are adequately briefed to

undertake this role. Following a trail permits a traditional role - goal orientated, instrumental, of knowledge transmission, and didactic. In a garden, a more general purpose could allow the parents to be facilitators within a context which is nearer the child's experience and understanding. As the data show, the children do make spontaneous references in some cases to their own experience (Tizzard & Hughes 1984) which can be built on. However, we as researchers have to acknowledge that briefing parents is time consuming for teachers and can be stressful especially if parental involvement with the school is restricted (Cullingford 1985; Edwards & Redfern 1988; David et al 1993), yet the effect of unbrieffed chaperones on the conversation content of pupils is noticeable (Tunnicliffe 1995). It is not a worthwhile use of time if conversation is stifled, lines of thought are not followed and parents are lacking in information. If they see themselves as no more than child minders for the visit their conversations are similar to those of family groups (Tunnicliffe 1995). Parental contribution must be progressively recognised and integrated (Jowett et al 1991; Edwards & Redfern 1988) into the programme for a visit. Each group should have a unique experience, which does not seem to be the case from the data obtained in this study which is similar for each school. The individual chaperones accompanying the sub groups could then report to the teacher in charge their contribution to the main objectives gleaned from the visit. In this way there would be some move towards education for change and not confirmation, understanding the science of plants and the need for conservation rather than mere facts (Cooper 1996).

Although mention has been made to the national curriculum for science, it is difficult to judge whether the pupils view the visit as practical science, or even as an environmental experience. There was no systematic examination of any scientific, geographical or environmental aspect of the garden or plants. Because the experience of gardens evokes memories and images of the home context, children's interaction with the plants within this context may be crucial to their future interest in the environment (Palmer & Suggate 1996). If this cannot happen, because domestic gardens are generally smaller and allotments dwindling in number (Crouch & Ward 1988), better use must be made of school gardens (Johnson & Ashdown 1997).

Putting these visits into perspective, the children experienced a 'nature walk' reacting to whatever passed in front of the group as it moved through the garden. Children did pick up items which, together with the trail sheet, would go back to school and help them to complete a national curriculum objective. But to what end? Unless there is sustained effort to integrate plants and gardening into the school context children will only see them as having a minor role. A single, isolated visit which has limited goals and a marginally child centred approach, gives negligible indication of the importance of plants in the environment and only tacit acceptance of plants as being essential to life and vital for the future of human kind.

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